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# VECTR

VIRTUAL ENVIRONMENT COMPUTATIONAL TRAINING RESOURCE

*The VECTR prototype is a collaboration between ? G7fg Computational GMMWg 6fUbWand Operations and Test Management ; fci d'to investigate the possibilities of virtual reality pathfinders*

The Exploration Ground Systems (EGS) Program at KSC is the organization responsible for safely integrating and launching the Space Launch System (SLS)/Multi-Purpose Crew Vehicle (MPCV) at Kennedy Space Center. Safely integrating, testing, and launching a vehicle involves successfully completing more than a thousand highly complex, primarily manual tasks and EGS is facing a number of significant schedule and budget-related challenges that demand maximum efficiency, even during this first processing flow.

Executing these tasks requires the right combination of people (skills, certifications, etc.), parts (Flight Hardware, Ground Support Equipment, etc.) and paper (procedures, work authorization documents, etc.). In many cases these tasks are performed on new flight hardware, by new technicians and engineers, using new equipment and tooling. In order to identify and ultimately mitigate the potential impacts of the learning curve the EGS Operations and Test Management group has performed a detailed

quantitative analysis of the impacts of learning curve on early Shuttle, Expendable Launch Vehicles (ELV), and test missions such as EFT-1 and Ares I-X flows and applied those findings to analogous operations planned for SLS/MPCV. Identifying and quantifying those impacts has provided the insight needed to focus training and development efforts on specific operations with a high risk of growth due to learning curve.

## VECTR Specifications:

- **Head Mounted Display:** Oculus Rift
- **Desktop PC:** Intel i5-4590 Windows 7 SP1 (or newer)
- **Video Card:** NVIDIA GTX 970 / AMD 290 (or greater)
- **Controller:** Xbox 360 controller
- **Engine:** Unity 3D



EGS has identified a number of pathfinder exercises as well as on-site manufacturing observation opportunities and is also leveraging Virtual Reality (VR) technologies to help train operators prior to flight hardware arrival and identify potential operational issues in an immersive environment.

One of those VR technologies being leveraged is the Virtual Environment Computational Training Resource (VECTR). VECTR is a virtual reality platform, built with commercial off-the-shelf hardware, designed to augment the training process for ground operations at KSC. VECTR utilizes existing virtual reality hardware and real-time game engine software to create digital training environments where engineers and technicians can practice working with predefined systems and procedures for current and future operations. VECTR is a flexible,

scalable platform that allows for model updates, if engineering designs change, and scenario updates, if a procedure changes. All aspects of the VECTR virtual environment can be changed and updated within the software by a developer, even if the hardware hasn't yet been built in the real world.

A training scenario can be built for the VECTR system at a lower cost than pathfinder hardware, and then distributed to multiple centers where personnel can train remotely. Commercial off-the-shelf virtual reality headsets, such as the Oculus Rift, generally cost somewhere between \$300 and \$500 per unit and the target computer configuration that the VECTR system is intended to run on is estimated to cost around \$1,000 per PC.



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